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Integrated review of the thematic cluster of energy for sustainable development, industrial development, air pollution/atmosphere and climate change in small island developing States

Report of the Secretary-General

Summary

The present report reviews the status of progress in small island developing States in the implementation of the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States, with specific focus on energy for sustainable development, industrial development, air pollution/atmosphere and climate change. The report was prepared in fulfilment of the mandate of the Commission on Sustainable Development at its thirteenth session, by which a special one-day session will be convened by the Commission at its fourteenth session to consider progress towards the sustainable development of small island developing States, within the framework of the thematic cluster under review by the Commission.

The report also describes the challenges small island developing States face in their efforts to advance implementation of the Mauritius Strategy.

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I. Introduction

1. At its thirteenth session, in April 2005, the Commission on Sustainable Development decided that it would devote one day of the review sessions of the Commission to consider implementation of the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States, focusing on that year's thematic cluster, as well as on any new developments regarding the sustainable development efforts of small island developing States, using existing modalities.[1] The present review is conducted pursuant to the decision to consider small island developing States-related cross-cutting issues at each session of the Commission.

2. The present report is prepared in response to the request made by the Commission at its thirteenth session for the Secretary-General to submit to the Commission at its review session a report concerning progress and obstacles in respect of sustainable development in small island developing States and making recommendations on enhancing its implementation. During preparation of a comprehensive update in respect of the thematic cluster, the linkages among energy for sustainable development in small island developing States, industrial development, air pollution and climate change were highlighted to demonstrate the inherent vulnerability of the said islands States.

3. The report presents the continuing needs by small island developing States of support for their efforts to implement the Programme of Action for the Sustainable Development of Small Island Developing States, the Plan of Implementation of the World Summit on Sustainable Development and the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States in respect of this cluster of issues as well as major regional and international support for those efforts. A summary of the continuing challenges that small island developing States must face in relation to this thematic cluster is also presented as a basis for consideration of the next steps to be taken.

4. Data used to prepare the present report were taken from diverse publications and periodic reports issued by organizations and bodies of the United Nations system, as well as regional and national assessment reports of small island developing States. The dependence on secondary data due to extremely limited primary data sources demonstrates the weak, often non-existent infrastructure for data collection in small island developing States. Indeed, the absence of reliable systems for measuring and monitoring progress represents a major challenge to the limited human and institutional capacity of small island developing States.

II. Linkages in the thematic cluster

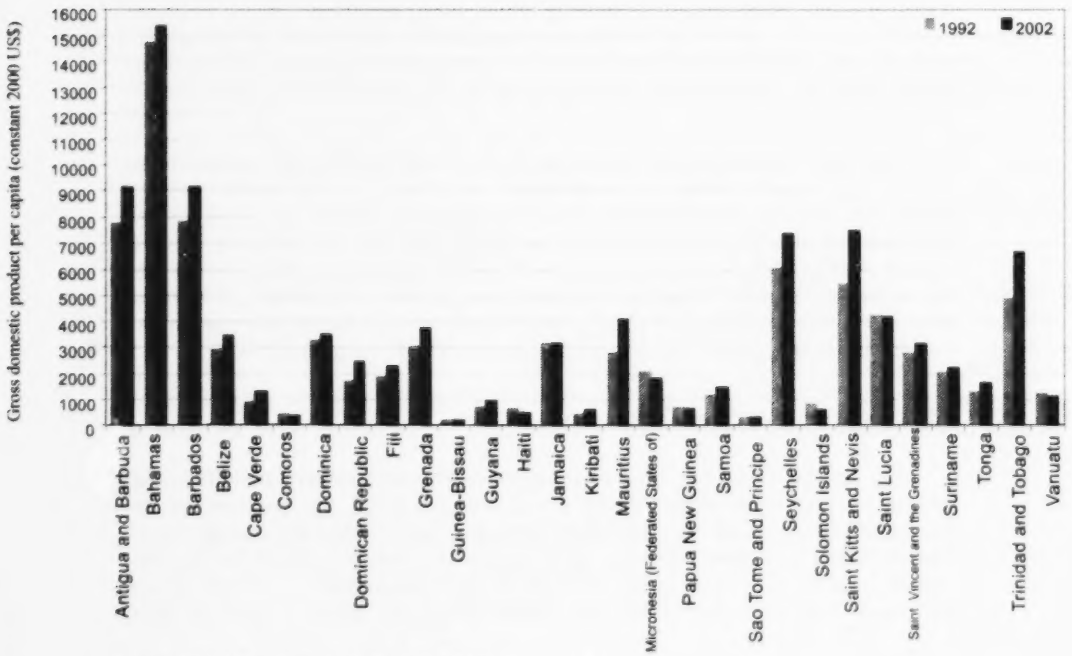
5. The issues of energy, industrial development, atmospheric pollution and climate change being considered in the current cycle of the Commission on Sustainable Development are particularly relevant to small island developing States, since it is in that cluster of issues that some of the most significant factors that contribute to the economic, social and environmental vulnerabilities of those States are found. The vulnerability of small island developing States is seen in their

inherent inability to adjust to external or internal, natural or man-made shocks because of physical and structural constraints.

6. Most small island developing States are remote, small in land area and population (less than 1.5 million), with a very narrow resource base and fragile land and marine ecosystems that are highly exposed to extreme natural disasters; their economies are open and heavily dependent on trade for national income. Many face high transportation and communication costs and have difficulty benefiting from economies of scale without access to export markets; with a few notable exceptions, most have limited human, institutional and financial capacity and face ever-increasing demographic and economic pressure on existing natural resources and ecosystems.

7. As figure 1 illustrates, small island developing States vary considerably in levels of per capita income. Nonetheless, several of them face the challenges typical of many developing countries: poverty and socio-economic inequalities within the population; significant external indebtedness with declining receipts from official development assistance; and increased competition for foreign direct investment. As a result, the mobilization of resources for public investment in infrastructure and social welfare has been challenging for some States. The increase in gross domestic product (GDP) per capita achieved by several (see figure 1) belies these structural challenges and internal inequities.

Figure 1
Gross domestic product per capita



Source: World Development Indicators (2005).

8. It is from this perspective that the interlinkages among the cluster of issues to be considered at the fourteenth session of the Commission are relevant. The present review of efforts by small island developing States to improve their access to and affordability of energy services for their populations and to promote industrial development will include consideration of the dependence of many States on fossil fuel imports for energy, and will address their initiatives in the development and use of renewable energy sources. The overall assessment of industrial development will take into account the impact of such development on sustainable development. The report will also assess progress in the promotion of competitive industries and how the air pollution problems of small island developing States are addressed, notably through promoting greater transport efficiency. The status of implementation of adaptation measures for climate change is also presented in the framework of wider efforts aimed at strengthening vulnerability assessment and monitoring.

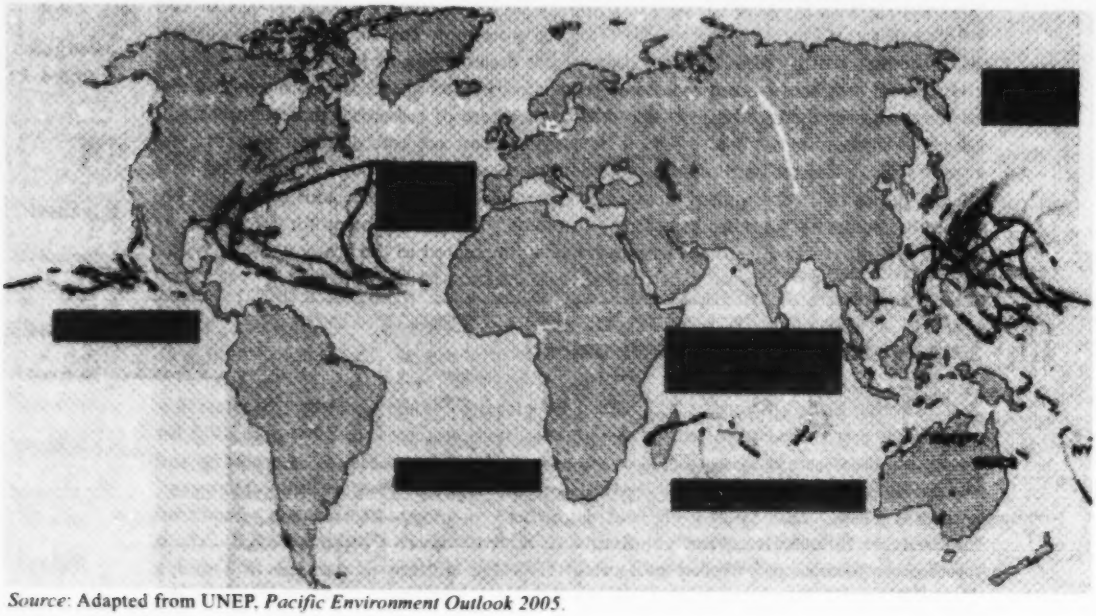
III. Vulnerability to natural disasters

9. The exposure of many small island developing States to natural disasters has significant economic, social and environmental consequences. In 2004 and 2005 for example, the Caribbean region saw an unprecedented number of hurricanes and storms. Figure 2 illustrates tropical storm and hurricane activity in 2004. That year, a single event, hurricane Ivan, did significant damage to Grenada, displaced hundreds of thousands of the population of at least seven Caribbean small island developing States, and caused more than US$ 111 million in damage in Jamaica alone.[2] Figure 3 shows the costs from the damage caused by natural disasters in the Caribbean basin over the past decade.

10. Beyond displacement of the population, such events also undermine the industries on which many economies of small island developing States are built. Chief among these are agricultural industries and tourism. Many States have suffered significant crop losses because of extreme weather events. Furthermore, because coastal tourism predominates in many small island developing States, hurricanes and tsunamis cause enormous damage to industry infrastructure, while rising sea levels and temperatures from climate change result in coral bleaching and coastal erosion, also degrading tourism-related natural assets.

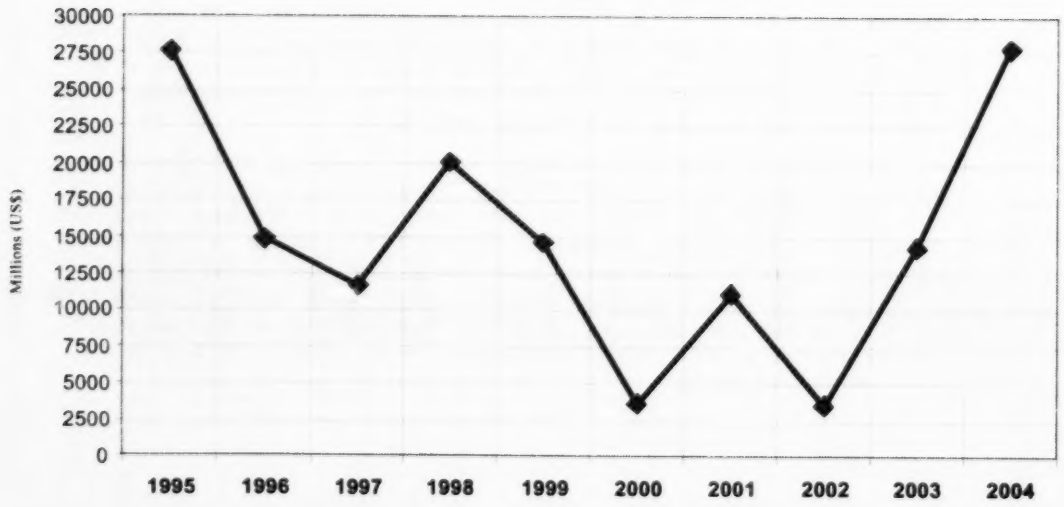
11. In some cases, notably the Maldives, Kiribati, Tuvalu and the Marshall Islands, coastal inundation (even total submersion) is increasingly a very real threat, as is the risk of saltwater intrusion into groundwater systems in low-lying atolls, endangering already scarce freshwater resources. The situation is further exacerbated by the pollution of coastal waters due to poor waste management in overburdened municipalities, heavy siltation and pesticide pollution from agricultural run-off, the result of poor agricultural practices, watershed degradation and deforestation in rural hillside communities for the purposes of housing, subsistence farming and fuel.

Figure 2
Tropical storm and hurricane activity in 2004



Source: Adapted from UNEP, *Pacific Environment Outlook 2005*.

Figure 3
Cost of natural disasters in the Caribbean basin



Note: Data cover entire Caribbean basin, including small island developing States and mainland.
Source: International Federation of Red Cross and Red Crescent Societies, *World Disasters Report 2005*.

Box 1
The Grenada experience

Hurricane Ivan was a category 4 system with sustained winds exceeding 140 miles per hour when it reached Grenada on 7 December 2004. In a single day, 28 people were killed and 90 per cent of the island's housing stock (representing 38 per cent of GDP) damaged. This included 90 per cent damage or destruction of hotel rooms, totalling EC$ 288 million (29 per cent of GDP), and damage to hospitals, schools, electricity installations and telecommunication facilities, with a combined value of 42 per cent of GDP.

Substantial damage was caused to ecotourism and cultural heritage sites accounting for 60 per cent job losses in that subsector, while the nutmeg and cocoa industries, which contributed 10 per cent of GDP, will require between six and eight years to recover before they can again contribute GDP and foreign exchange earnings.

Overall damage was estimated at EC$ 2.2 billion, twice the value of the island's total GDP. Following Ivan's passage in 2004, Grenada's economic growth forecast shrank from 5.7 per cent to -1.4 per cent.

The island had scarcely embarked on its road to recovery when it was hit by hurricane Emily on 14 July 2005, causing damage estimated at EC$ 140 million, or 12.9 per cent of GDP, and displacing 38 per cent of the population.

Source: OECS, 2004.

12. The interdependence of the challenges that the cluster of issues poses for small island developing States underscores the importance of an integrated approach that accounts for their vulnerabilities. Small island developing States could devise more effective resilience-building strategies: for example, with the application of innovative alternative energy technology, sewage could be converted to methane and fertilizer, addressing at once waste disposal and alternate energy generation, with a dividend for agricultural production. The success of such initiatives, however, will depend on the political support for their development and access to financial and technical resources for the development of appropriate technology.

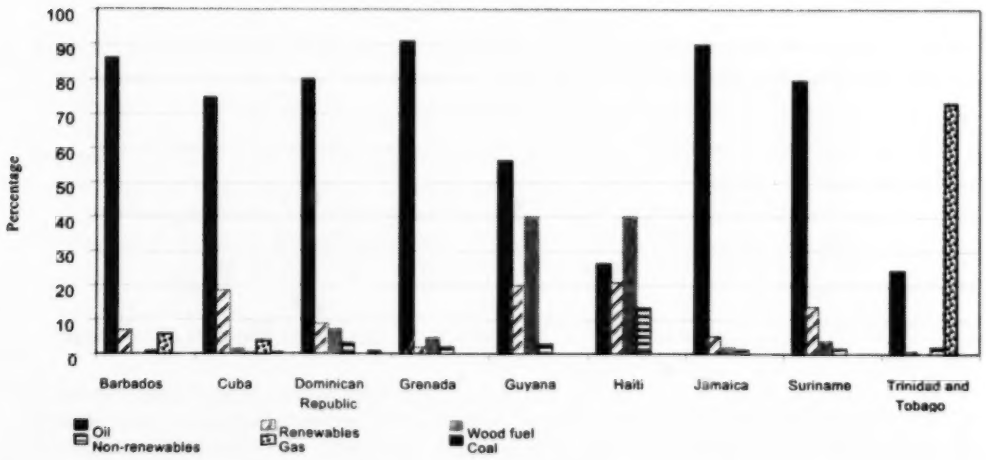
IV. Energy for poverty reduction and sustainable development

13. With few exceptions, most small island developing States are highly dependent on imported fossil fuels for energy. As they have continued to develop, their demand for fossil fuels has also increased, in particular for electricity production. Considering their distance from markets and metropolitan centres as well as the multi-island characteristic of many States, transportation remains crucial to their development. Transport is thus the fastest growing consumer of oil, with fuel needs for transport to remote islands especially high.

14. Some poor communities in certain small island developing States continue to use traditional energy sources. In Haiti, for example, 60 per cent of energy is sourced from charcoal and fuelwood.[3] This practice not only has a negative effect on the fragile ecosystems on which the major industries in small island developing States depend, but also contributes to air pollution.

15. Dependence on oil imports, however, is what places the greatest strain on many small island developing States, particularly in the event of steep rises in oil prices. On average, more than 90 per cent of energy is sourced from oil imports, which account for the largest percentage of foreign exchange earnings of small island developing States. Figure 4 illustrates the distribution of energy sources in a select group of Caribbean States. Oil will remain the most important commercial energy source for most States for the foreseeable future, despite efforts to develop alternative energy sources. High fuel transport costs to remote islands add significantly to energy costs: for example, because of their remoteness, the landed price of oil products in many Pacific small island developing States is typically 200 to 300 per cent higher than average international prices. The energy-cost disincentive for foreign investment contributes to undermining competitiveness. High energy costs also contribute to price inflation of all domestic goods and services, including transportation and food, with a direct negative effect on the socio-economic well-being of the population, particularly the poor. The situation demands strategies for improved efficiency in energy consumption and investment in locally produced alternative energy sources. These efforts have proved challenging for heavily indebted, income-poor States.

Figure 4
Caribbean energy supply



Note: Renewables = charcoal + cane + hydro; wood fuel = sustainable wood fuel for household, industry and agriculture; non-renewables = non-sustainable wood fuel + other non-renewables (excluding fossil fuels).
Source: ECLAC, *Renewable Energy Sources in Latin America and the Caribbean; situation and policy proposals* (2004).

A. Providing access to affordable energy services to the poor

16. Small island developing States enjoy varying degrees of access to energy resources. It is estimated that in Pacific island countries, approximately 70 per cent of the population has no access to modern energy services, with many living in remote islands or rural areas. Because of this very large gap in coverage, meeting the basic energy requirements and sustainable socio-economic development needs of peoples with subsistence incomes remains a priority, particularly in the Pacific. In the Atlantic, the Indian Ocean, Mediterranean and South China Sea and the Caribbean region, where electricity and other energy distribution networks reach much of the population, affordability of energy services remains a major problem for the poor.

17. For many small island developing States, access to energy is linked to reliability of supply. This is a particular challenge for the archipelagic or multi-island States, as well as for those with remote inland or isolated coastal areas. Most rural communities tend to use smaller diesel generator units that are less efficient than larger ones, particularly when they are run intermittently. This is often the case in small communities, where resources to pay for imported fuel are limited. In such circumstances, energy is used only when absolutely necessary, inevitably in an inefficient manner.

18. Access and affordability are closely linked, and in many cases have implications for the development of small-scale renewable energy applications. The Marshall Islands, for example, has developed a project for outer island electrification which would utilize small-scale photovoltaic technology as well as biomass digesters and coconut oil as a diesel substitute in small generators. It is proposed that the cost of implementation be shared among the Government, a local private utility corporation and an international donor. If successful in promoting access to energy in an affordable manner for the outer islands communities, it would represent an excellent example of partnership in energy management for sustainable development for remote, poor communities in many small island developing States.

19. There has also been research on smaller scale digester systems in Jamaica and in the Cook Islands that could be utilized in rural areas and in remote islands to improve energy efficiency while utilizing waste materials. Such initiatives are part of a set of measures to build resilience in small island developing States.

B. Promoting the development and use of renewable energy

20. More extensive use of renewable energy in small island developing States would significantly contribute towards reducing their vulnerability and building their resilience. While there is much potential for the further development of renewable energy sources in those States, the share of renewables in total energy supply remains small. This may be attributed in some cases to a lack of information and local technical and institutional capacity in renewable energy technologies, the absence of policies to promote their research and development, and, most significantly, inadequate financing and investment opportunities for their development, whether from private entrepreneurs or through international support.

21. A number of ongoing initiatives, however, demonstrate the commitment of some small island developing States to expanding their own renewable energy

sources. The Caribbean Renewable Energy Development Project focuses on renewable energy as a means of reducing dependence on fossil fuels, through promotion of biomass, cogeneration, geothermal energy, landfill gas and wind-grid integration. This innovative regional project promotes renewable energy while mitigating the risk to investors in renewable energy projects, by addressing the economic, transaction-cost and revenue risks. Niue recently signed an agreement with Greenpeace to develop a 100 per cent renewable energy programme for the island using primarily wind power and biomass.

22. Small island developing States have a relatively constant supply of solar energy. Direct solar energy is currently used in many of them for heating water, and to some extent in the Caribbean for crop drying and processing. Effective application of fiscal incentives in Barbados resulted in the significant expansion of use of solar water heaters. The use of small-scale solar photovoltaic power to provide electricity in rural areas and remote islands with isolated pockets of low-load densities also appears to have been successful in some States, though more work on financing and institutional arrangements is required to effectively promote further commercialization.

23. The production of cleaner alternative energy sources, such as biofuel from sugar cane, coconuts or other biomass products, is being researched and pursued. Their use would also assist in combating land degradation, as they could be planted on degraded or unused land (particularly the high yielding varieties of short rotation species), or restore coconut groves. The emerging biofuels policy in Fiji will promote planting on degraded lands, reducing net emissions of greenhouse gases.

24. Ambient air quality would be improved by using more ethanol-gasoline and coconut-diesel blends. Use of ethanol is being explored in a number of small island developing States, including Jamaica and the Dominican Republic. There are also examples of simple improvements in technologies and techniques which have yielded greater profitability for renewable sources (such as biomass). In the Cook Islands, for example, the switch from a copra-production to a cold-press method for processing coconut milk has resulted in a more efficient, cleaner production of oil.

25. There are many practical examples of functioning biomass systems in certain States. The conversion of buses in Vanuatu and tugboats in the Marshall Islands to run on coconut oil instead of diesel was largely the result of research by independent entrepreneurs who sought a solution for rising fuel prices and a dwindling market for coconut oil. Although traditional biomass fuel usage in small island developing States is both inefficient and unsustainable, biomass energy offers enormous potential for renewable energy technology applications. Comprehensive technical feasibility assessments for geothermal and wind energy are still to be undertaken.

26. Hydropower resources for electricity production are extensive only in a few islands (for example in Fiji, Jamaica, the Solomon Islands, Samoa and Vanuatu), though many island countries have mini hydropower capacity of a few megawatts.

27. Since the management and disposal of wastes is a major concern for small island developing States, waste-to-energy or biogas systems are being given serious consideration for their role in converting organic wastes into sustainable energy and organic fertilizer.

28. A more efficient dissemination of information on renewable energy technologies and practices in small island developing States would promote wider

knowledge of existing possibilities in alternative energy development. There is also a need for technical advice and training to carry out cost-benefit analyses to ensure that the particular choice of renewable energy gives an optimum return to the economy.

Box 2

A regional assessment of renewable energy potential in the Pacific

A regional assessment of renewable energy potential in the Pacific estimates total potential energy from hydro, solar and other renewable sources could reach 365,349 kilowatt hours, equivalent to half of Fiji's power consumption in 2004. If a medium-sized home in the Pacific consumes 100 to 250 kilowatt hours of electricity, approximately 120,000 homes can be serviced by 365,349 kilowatt hours. With a standard diesel plant conversion of 0.25 litre per kWr, small island developing States can save 90 million litres of diesel, or US$ 60 million. The South Pacific Regional Environment Programme/United Nations Development Programme audit shows that Fiji can produce 11,000 kilowatts of electricity from agriculture, 3,000 kilowatts of electricity from forestry and 125 kilowatts of electricity from biofuel. For wind power, Fiji has the potential to produce 75 kWh, compared to the current production of 1 kWr (as at 2003).

Along with Papua New Guinea, five other small island developing States have the potential to exploit hydropower: Fiji (over 90,185 kilowatts of electricity), Samoa (11,060), Federated States of Micronesia (2,060), Vanuatu (600) and the Solomon Islands (455). Solar energy holds much promise for Fiji, the Cook Islands and Tonga, each with the potential to produce 3,000, 2,000 and 1,000 kilowatts of electricity respectively.

Cost and maintenance are major factors hampering the wider use of renewable energy in the Pacific. Other obstacles include institutional, financial and market factors, lack of awareness and capacity, technical, policy and regulatory issues. Small island developing States will seek to address these issues through targeted projects, and will also initiate cost analyses, which would show the savings each country would make.

Source: South Pacific Regional Environment Programme, 2006.

C. Promoting energy efficiency in key areas of industrial development

29. Many small island developing States have been relatively slow to adopt energy efficiency practices and designs, mainly due to lack of appropriate policy, information, awareness and education, and a general reluctance by consumers and energy suppliers to make the initial investment required to achieve future savings.

30. More efficient energy systems help reduce costs, the volume and costs of imported fossil fuels, while improving local air quality and reducing the emission of greenhouse gases. In Jamaica, a national energy fund designed to assist with the

financing of energy efficiency programmes is currently under consideration. Other measures undertaken by Jamaica to promote energy efficiency include the reduction or abolition of customs duty on imported energy-efficient technologies, and the reduction of consumption taxes on energy-efficient equipment. The lack of skilled personnel in the area of power system analysis, design and in effective operation and maintenance procedures has limited the ability of power utilities in some small island developing States to address energy efficiencies, particularly in the power generating system.

31. The equipment used in electricity generation also contributes to inefficiency in power production and distribution as a result of inadequacies in procurement specifications. The opportunities for efficiency gains are therefore numerous, as shown by the analysis contained in a number of national communications submitted to the United Nations Framework Convention on Climate Change by regional organizations of certain small island developing States and by agencies of the United Nations system.

32. Grenada reported that it was developing a comprehensive policy to address energy demand and supply for both residences and industry, looking at energy audits for all levels of energy production and use, and introducing incentives for renewable energy and energy-efficient applications. Seychelles reported that the options being considered included heat recovery from the public electricity generating plants; promotion of renewable energy technologies and energy-efficient appliances in the energy end-use sector; and supply-side management, including the reduction in electricity losses. On the demand side, Seychelles proposes to establish an energy efficiency and renewable energy office that would assist with information and energy audits.

V. Towards sustainable industrial development

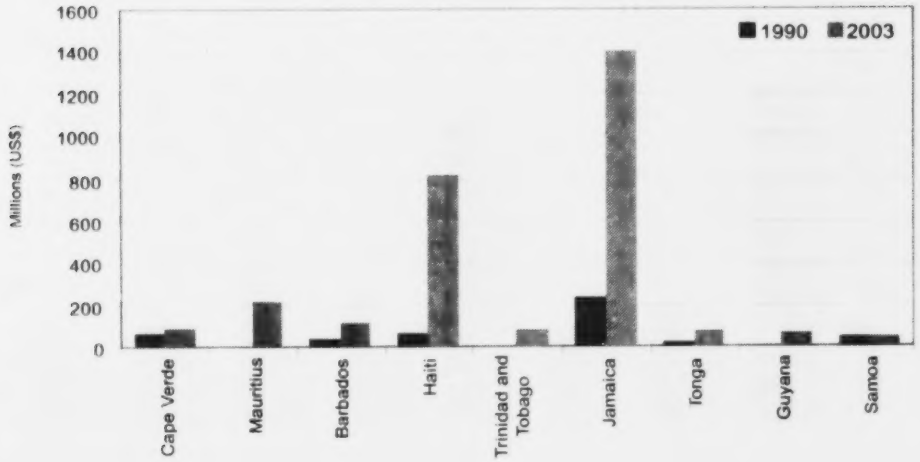
A. Industrial development and poverty eradication

33. For many small island developing States, their small size has been an obstacle to efficiency and competitiveness in the development of their indigenous industries. Many have a narrow range of mostly primary products to trade, many of which are subject to price fluctuation and long-term relative price declines. While some States have been successfully pursuing efforts to diversify into such areas as financial services and a few have oil and mineral resources, many others depend for most of their export income on a combination of single-crop agricultural industry, fisheries and tourism. With trade liberalization, these open economies have been substantially affected by external economic competition and the loss of preferential trading arrangements on traditional commodity exports, notably sugar and bananas.

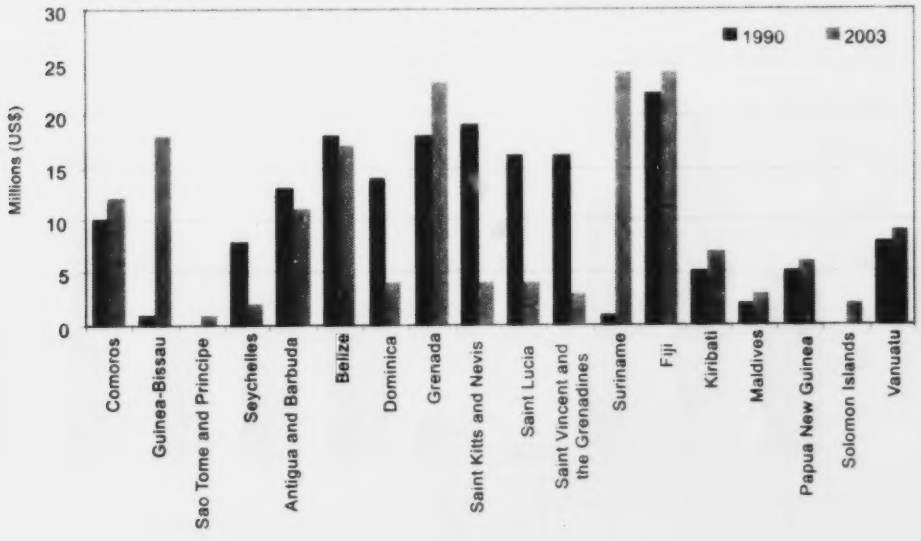
34. For many States, in addition to increased income flows from remittances (see figure 5), the tourism sector has become an important contributor to national income and foreign exchange earnings. Figure 6 shows the increase in tourist arrivals in a select group of small island developing States. The tourism industry has however not been able to compensate for the decline in employment among the rural poor that has resulted from the demise of important agricultural industries, which were the largest single employers of manual labour.

Figure 5
Workers remittances and compensation of employees

A. Countries with higher worker remittances and compensation of employees



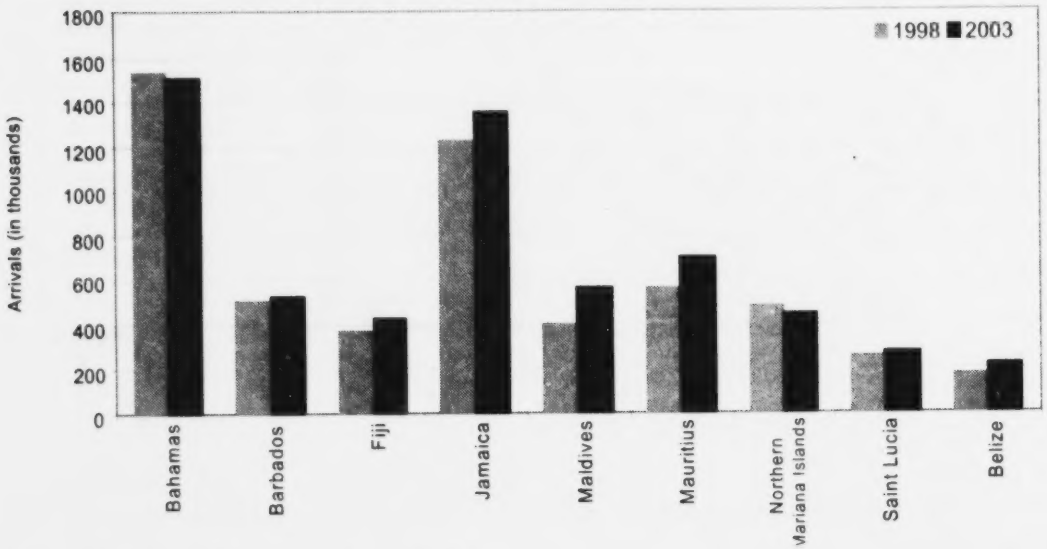
B. Countries with lower worker remittances and compensation of employees



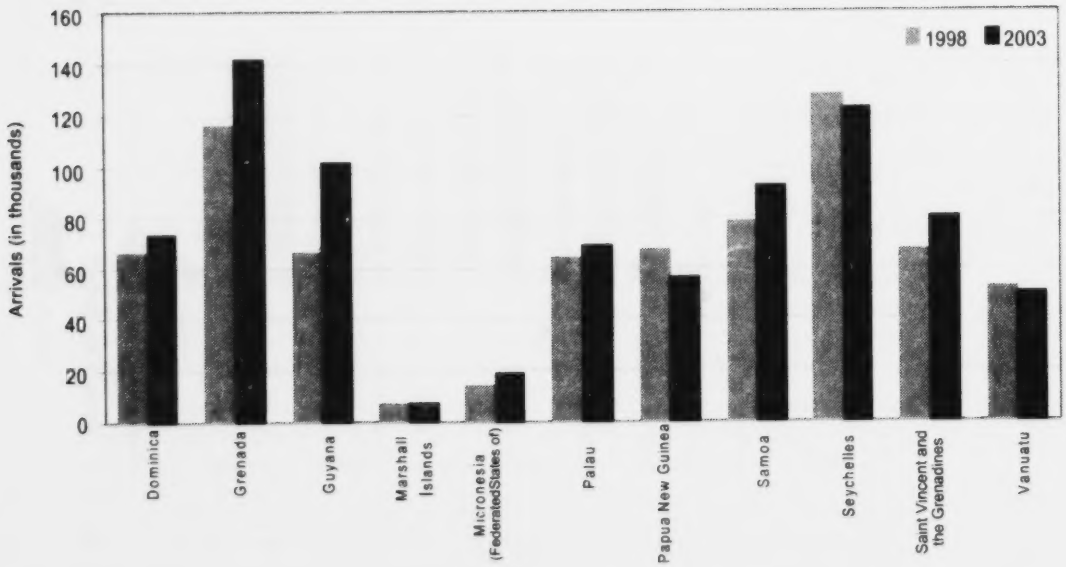
Source: World Bank, *World Development Index, 2005*.

Figure 6
Tourism arrivals

A. Countries with highest tourism arrivals



B. Countries with lowest tourism arrivals



Source: World Bank, *World Development Index, 2005*.

35. The decline of agriculture and related processing industries has directly contributed to increased levels of poverty and economic displacement in many rural communities, resulting in a rural to urban drift, with attendant strain on municipal services and socio-economic support for growing urban populations.

36. The small island developing States of the Atlantic, the Indian Ocean, the Mediterranean and South China Sea have few natural mineral resources and little fertile land for agriculture and forestry. The main resources for most are their coastlines for tourism and marine areas for commercial fishing. In Seychelles, for example, coastal tourism contributes between 46 and 50 per cent of GDP, 70 per cent of foreign exchange earnings and employs 20 per cent of the population. Fisheries and canned tuna are the other main sources of export earnings. Export of tuna constituted 77 per cent of Maldives total marine product exports in 2003. In the Comoros, agriculture employs almost 80 per cent of the population and generates 38 per cent of GDP.

37. The more developed States such as Mauritius and Seychelles, have promoted and established viable secondary and tertiary sectors, including manufacturing and off-shore business and financial services. They have created fresh initiatives in social security and welfare provision and policies on ownership of land, encouraging worker, family and community participation in commercial activity and commercial ownership, with the aim to reduce social dependence and encourage partnership in social and economic progress. They manufacture goods using domestic material inputs under franchise for local markets, reducing dependence on imports and making a wider range of goods available at lower prices for local consumption.

38. Other States, such as the Comoros, Sao Tome and Principe and Guinea-Bissau, face greater challenges to social and economic development. Maldives and Cape Verde face graduation from least developed country status, raising serious concern regarding the expected impact of the loss of benefits derived from concessionary treatment on their economic performance and consequently on the standard of living of their populations. Smooth transition policies are necessary if the economic gains made to date are not to be lost.

39. In the Pacific region, coastal and marine resources underpin the subsistence economies that still characterize many island States. Agriculture remains the single largest sector, employing between 40 and 80 per cent of the population and constituting between 20 and 40 per cent of GDP and over 50 per cent of exports. Subsistence agriculture is still the main source of real income and the main insurance against poverty for the majority of rural communities, and also for many urban residents with rural relatives. The agricultural sector is dominated by diversified small-scale semi-subsistence farm households with a few large commercial plantations. In many countries, root and tree crops still dominate agriculture production. In smaller islands and atolls, agro-forestry and tree crops provide most of the food, medicine, construction materials and other products and services which would be too expensive to import.

40. The role of the manufacturing sector in many Pacific island States is minimal, reflecting a weak industrial base that is restricted mostly to the processing of primary goods, including coconut oil-based products. Some countries, such as Papua

New Guinea, Fiji and the Solomon Islands, rely on large mineral resources for their development. The economic significance of mineral exploitation is reflected in the related export earnings. For example, in Papua New Guinea, the mineral sector accounts for 32 per cent of export earnings, and 30 per cent for those of the Solomon Islands. Training and capacity-building in mineral assessment and earth science are being initiated. However, much of the wealth from mining and tourism does not reach the community level, and service providers in the tourism industry are often employed on low wages.

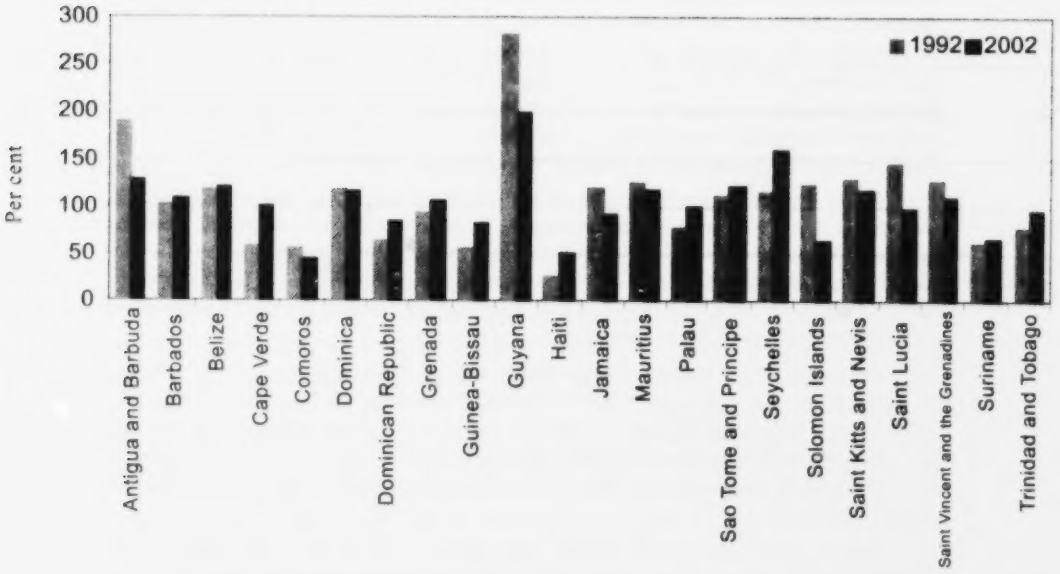
41. The Caribbean States have evolved from a concentration on primary products — mainly specializing in sugar, rice, coffee and bananas, with mineral extraction important in the larger countries — to more service-oriented economies. Tourism is acknowledged as the industry with the greatest growth potential in many States, with financial services becoming increasingly important in a few, such as the Bahamas, Barbados and Jamaica. The services sector in the Caribbean has an average annual growth rate of nearly five per cent. Tourism accounts for the largest share of the services sector. Manufacturing has generally remained small, limited mostly to the processing of agricultural products, minerals and some light industry, with the exception of Trinidad and Tobago, where the industrial sector remains more prominent than in other countries.

42. Despite a number of significant challenges, the Caribbean has continued to see a sustained growth in per capita income, with most countries having achieved middle-income status. However, poverty levels remain high in many countries, such as Haiti and Guyana, while significant pockets of poverty can be found in eastern Caribbean States with high levels of unemployment. Growing unemployment, declining real wages in the agriculture sector and limited employment opportunities underscore the poverty crisis in the rural sector. At the same time, the Caribbean has witnessed the increasing migration of its highly educated and trained work force, contributing to a chronic skills deficit.

B. Promotion of competitive industries

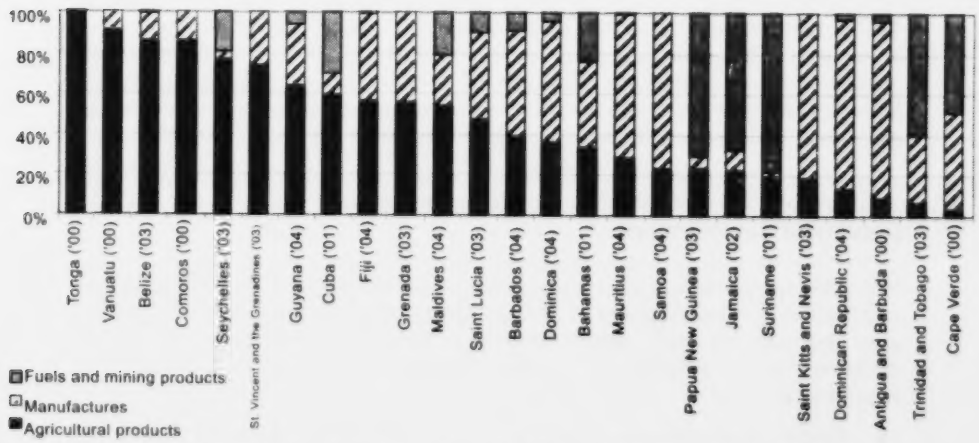
43. Competitiveness is essential for the economic success of small island developing States. Trade is central to their economic development (see figure 7), and holds even greater potential in the right conditions. The impact of globalization and trade liberalization on their economic competitiveness is a major concern for many States. While there may be opportunities for niche market development, the erosion of trade preferences has adversely affected commodity and light manufactured exports, particularly bananas, sugar and textiles. Many States are still heavily dependent on agriculture, which generates a sizeable share of their export earnings (see figure 8).

Figure 7
Trade as a percentage of gross domestic product



Source: World Bank, *World Development Index, 2005*.

Figure 8
Structure of exports in selected small island developing States
(Latest available data)



Source: United Nations Department of Economic and Social Affairs, based on data of the World Tourism Organization.

44. The trade-dependent economies of small island developing States are uniformly turning to services in which they have a competitive advantage. Efforts at economic diversification have focused on tourism, information and communications technology, the development of niche markets and, in the case of the Bahamas, Barbados, Mauritius and Vanuatu, the development of the financial services sector, particularly offshore banking services. Barbados is an example of a Caribbean State that has made the transition from an agricultural to a service-oriented economy through the implementation of institutional and policy measures which have increased productivity and enhanced international price competitiveness. Tuvalu and Niue have been successful in marketing their Internet domain names.

45. Many Pacific island countries, however, have lagged in terms of economic growth and international competitiveness. Constraints to development include unskilled human resources, poor labour productivity, distortions in land and labour markets and a lack of incentives for more dynamic development of the private sector. In addition, the inability to achieve economies of scale has direct bearing on the competitiveness of these countries.

46. Moreover, their narrow resource base and the challenges faced in gaining market access have, in most cases, affected their ability to mobilize savings for investments. In general, action is needed to improve the investment climate through sound fiscal and financial policies and create a conducive environment to encourage the development of capital markets, private domestic activity and foreign and local direct investment.

47. Small island developing States also need to maximize opportunities for diversification into the production of high-quality goods and services for niche markets. Barbados has successfully established a niche market for its rum exports, Fiji for its mineral water and furniture industries. The successful experience of some small island developing States is relevant and applicable to others with similar characteristics. Through enhanced cooperation and partnerships between them, experience can be shared. Consideration is also being given by many States to mainstreaming traditional and informal sectors to optimize their potential contribution to the economy while alleviating poverty.

48. Caribbean small island developing States have also recognized the importance of regional integration as part of an overall strategy for the strengthening of international competitiveness. Through the development of a common market, intraregional trade has boosted exports for a number of countries in the region, particularly Trinidad and Tobago, Jamaica and Barbados.

C. Addressing the sustainable development impact of industrial development

49. The rapid growth of the tourism industry has exacerbated the vulnerability of small island developing States to climate change and rising sea levels by putting great demands on local natural resources. Increased dependence on tourism therefore makes adapting to climate change critical to their sustainable development.

50. Despite improvements in legislative and institutional frameworks and the institution of mandatory requirements for environmental impact assessments for

new tourism investments, many small island developing States still have to surmount considerable difficulties, such as poor infrastructural, technological and human resource capacity, in dealing with the problems of waste management and pollution. Conservation of natural resources and biodiversity is an imperative for the development of the niche market of eco-tourism in many States.

51. Natural resource extraction and transformation for industry and trade have in many cases had a negative impact on the fragile ecosystems of many small island developing States. Land and marine-based sources of pollution have led to increased solid and liquid waste in coastal regions. In agriculture, inorganic fertilizers, herbicides and pesticides are often overused. Mauritius, for example, uses five times more fertilizer for its sugar plantation than the world average of 113 kilograms per hectare, which poses a serious threat to freshwater reservoirs.

52. Land degradation, soil erosion and rapid deforestation are of primary concern to small island developing States. Generally, land is cleared for commercial cultivation and urban or industrial development. The continued deterioration of forests is mainly due to unsustainable patterns of consumption and production. The average annual rate of deforestation over the last five years has approached 2 per cent.

53. Coral reefs face threats from water pollution caused by sewage, pesticides and fertilizers, and have been damaged by certain fishing methods and recreational and tourism activities. Marine ecosystems have been adversely affected by the overfishing of local stocks. While aquaculture has the potential for alleviating pressure on wild stocks, it has a serious environmental impact, such as the clearance of mangroves and other coastal vegetation for ponds, declining water quality caused by nutrient enrichment and oxygen depletion of outflowing water.

VI. Climate change adaptation and air pollution mitigation

54. The adverse effects of climate change and rising sea levels present significant risks to the sustainable development of small island developing States. In its third assessment report, the Intergovernmental Panel on Climate Change noted that the characteristics of small island developing States limit the capacity of small island States to mitigate and adapt to future climate and sea level change. The report also noted that the most significant and immediate consequences for many States would be related to changes in sea level, rainfall, soil-moisture budgets, prevailing winds and short-term variation in wave action patterns at local and regional levels.

55. Small island developing States themselves have identified these issues for priority action in their national communications to the United Nations Framework Convention on Climate Change. It should be noted that only the first national communications, submitted between 1997 and 2003, are available. Second national communications have not been commenced, so information on actual implementation of adaptation options is limited.

A. Strengthening adaptation measures for climate change and rising sea levels

56. Adaptation measures are increasingly acknowledged as crucial to the survival of small island developing States. Some proposals featured in national communications for further consideration as adaptation measures include:

- Management and infrastructure development in agriculture: Mauritius has proposed policies for increased planting, improved irrigation and greater efficiency in anticipation of the effects of climate change;
- Water resources: more efficient management of demand and supply; improved monitoring and forecasting systems for floods and droughts (Seychelles); desalination of sea water (Federated States of Micronesia);
- Human settlement and infrastructure: hazard mapping; improved forecasting and early warning systems; insurance provision (Antigua and Barbuda);
- Public health: development of a health surveillance and forecast system; strengthening of data collection and reporting systems; vaccination campaigns and health education (Saint Kitts and Nevis);
- Tourism: protection of essential facilities and infrastructure as part of an integrated coastal zone management strategy (Barbados, Grenada, Jamaica, Saint Lucia and Singapore);
- Coastal zone: integrated, sustainable coastal zone resource management (Dominica).

57. The above are key areas for adaptation, with examples of possible action. However, limited human, technical and financial capacities have delayed implementation of these activities, and the process for ensuring access to and delivery of international resources is not yet complete.

58. Some small island developing States in the Atlantic, the Indian Ocean, the Mediterranean and the South China Sea have conducted studies on the impact of climate change and rising sea levels on various key socio-economic sectors, and have begun preparation of national adaptation plans or strategies. At the regional level, the Indian Ocean Commission has proposed a three-year programme of work on climate change, focusing on developing guidelines, training for local and national staff, technical expertise development, the establishment of a regional database and country-based awareness programmes.

59. The Caribbean region has also been actively engaged in work on adaptation through the processes established under the United Nations Framework Convention on Climate Change, such as the expert group on technology transfer and in the work on adaptation methodologies. A handbook assessing technological requirements is being prepared to assist States to make informed decisions on adaptation issues in such key sectors as water resources management, agriculture, human health, coastal and marine resources, infrastructure, tourism and biodiversity. The handbook, which is still being finalized, provides a description of the steps to help ensure that assessments are conducted effectively and efficiently.

60. Three types of activity are required: institutional arrangements and stakeholder engagement; descriptions of assessment processes and activities; and implementation.

61. Most small island developing States are beginning a process of assessing adaptation measures and the technologies or expertise required for implementation, following the staged approach endorsed by the Conference of the Parties to the Convention. The approach first investigates vulnerability in all sectors and regions. States have noted the importance of having reliable and detailed information on coastal dynamics and historical data. The example of the construction of the sea wall in Male, Maldives, has shown that there is a need for a full understanding of the ocean and coastal area interaction, since beaches and lagoons are highly dynamic systems, where the interaction of biodiversity with the environment may be sensitive to changes.

62. Stage two of the approach involves planning. In their reports, the Pacific island States have raised the issue of traditional adaptation measures, such as the practice in many Pacific islands of declaring an area "set-aside" or "taboo" for a certain period of time, often resulting in the recovery and regeneration of a depleted area. Maintaining and replenishing mangrove formations can have a highly beneficial effect on the preservation of coastal areas, as demonstrated in Belize.

63. Lastly, in stage three, the measures that have been investigated and planned are implemented. Financial assistance at that stage in the process is crucial if effective implementation is to be assured.

64. National adaptation programmes of action within the United Nations Framework Convention on Climate Change allow the least developed island States to gain access to additional resources for adaptation. To date, however, none have completed their programmes of action.

B. Strengthening vulnerability assessment and monitoring capacity

65. The recently completed Caribbean project on planning for adaptation to climate change, has assisted Caribbean Community States to develop national programmes to address climate change. The design of a regional sea level/climate monitoring network and regional database and information systems, the establishment of national climate committees and the future work of the Caribbean Community climate change centre — to mainstream climate change issues, improve outreach and capacity-building and disseminate information — are the main outcomes of the project.

66. There has been regional support in the Pacific for national efforts to develop strategies and measures on adaptation, technical guidelines and methodologies to facilitate adaptation. There has been a trend towards collaboration to address climate change and variability, such as the annual regional meeting of meteorological directors, which examines ways to plan and prepare for climate and natural variability events, as well as for exchanging information. Vulnerability and assessment training is institutionalized at the University of the South Pacific.

67. In the Atlantic, the Indian Ocean, the Mediterranean and the South China Sea, several challenges remain for effective vulnerability assessment and monitoring. Many of the sea-level monitoring stations installed in the mid-1980s are becoming

obsolete, indeed the network urgently requires upgrading. A major constraint to the implementation of programmes identified in initial national communications and climate change action plans is the lack of both human capacity and funding to conduct related research and reliable assessments. However, some States are working through other initiatives, such as the International Coral Reef Initiative, the Global Climate Observation System and the Agricultural Impact Assessment of Climate Change.

68. Significant efforts have been made by many small island developing States in research to strengthen vulnerability assessments. The University of the West Indies Centre for Environment and Development and the Capacity 2015 programme of the United Nations Development Programme (UNDP) sponsored several meetings of experts in anticipation of the International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. The meetings addressed the issues of capacity-building for renewable energy and energy efficiency; strategies to enhance resilience, including the role of the private sector, civil society and trade; waste management; capacity-building for sustainable development through training, education and public awareness; opportunities for resilience-building and vulnerability reduction through ocean management; the role of science and technology for sustainable development; strengthening the negotiating capacity of small island developing States; and establishing a consortium of universities from small island developing States.

69. A common feature of the meetings was the focus on resilience-building. Recommendations were addressed from sectoral as well as cross-sectoral perspectives. A UNDP resilience-building facility was established at the Meeting to develop and implement resilience-building programmes in small island developing States. The initiative, which has to date supported work on a Fiji biofuels programme and a similar effort in Cuba, is in need of further financial support.

70. Another important initiative to further assessment and monitoring capacity is the University Consortium of small island developing States. The Consortium was inaugurated at the Meeting in 2005, to support small island developing States through targeted research on resilience-building. Once operational, it is expected that such research will further strengthen the capacity of island States to address crucial issues, including energy and climate change. A funding proposal is currently being developed by the programme coordinator of the Consortium.

C. Promoting transport sector efficiency for the reduction of air pollution

71. In most small island developing States, the transportation sector has been growing steadily, with most reporting an increase in the number of vehicles in use. While lead additives have been phased out in most States, air pollution from older vehicles remains an issue. Furthermore, many States report that the growth in vehicle use due to lifestyle changes has caused congestion on roadways built to accommodate less traffic.

72. In its national communication to the United Nations Framework Convention on Climate Change, Antigua and Barbuda underscored the need to integrate greenhouse gas mitigation objectives with wider societal goals, such as reduced traffic congestion and increased economic productivity. This would integrally

involve the development of a road transportation master plan, with goals for sustainable transportation modes set as part of wider socio-economic planning, and programmes for creating consumer awareness. This is an area where international cooperation is desirable.

73. Mauritius intends to promote the use of biofuels in transportation. Since it is already producing energy from sugar cane bagasse, local expertise exists to ensure diversification into a biofuels industry in the same manner as that planned in Fiji, which has developed the first phases of a biofuels programme.

74. In cases where coconut oil is used as a diesel substitute (mostly in city buses), such as in Vanuatu and the Marshall Islands, the reduction of particulate matter has been significant, as has that of sulphur dioxide, depending on the percentage of diesel retained in the blend.

VII. Means of implementation

75. Small island developing States acknowledge that meaningful development in energy efficiency will be dependent on investment in human and institutional capacity and on their success in gaining access to appropriate technology. Policies being implemented include programmes to increase consumer awareness of conservation and a greater use of alternative energy sources. Much attention has been given to the involvement of civil society and community groups, taking into account the effectiveness of a more participatory approach in ensuring lasting transformation and change.

76. There are also ongoing efforts to involve private entrepreneurs in the development and marketing of renewable energy technologies. In this regard, a range of policy measures to promote and advance research in renewable energy has been undertaken, such as the implementation of laws lowering the duty on components for the development of renewable energy technologies. Attention is being turned to technical and institutional capacity in the study of greenhouse gas data and to undertake relative inventories. The capacity for collecting and analysing long-term climatological data and for developing regional climate models at an appropriate scale for use by small island developing States is being strengthened. Vulnerability and impact assessments and the development of adaptation options are also critical areas for capacity-building and the institutional strengthening currently being pursued by many island States at the national level.

77. Small island developing States have sought to mainstream adaptation strategies and resilience-building measures into existing national development planning. Mobilizing the resources to meet the costs of adaptation, however, remains a challenge. These costs are not negligible: in Jamaica, for example, it is estimated that engineered coastal protection measures alone against a one-metre rise in sea level would cost some US$ 462 million. In Kiribati, it is estimated that if no adaptation measures are undertaken, by 2050 the island State could face economic damages due to climate change and rising sea levels of US$ 8 to $16 million a year, equivalent to 17-34 per cent of its 1998 GDP.[4] Costs would be even higher if, for example, health implications were considered. As a start, a $3.1 million pilot adaptation project is currently being considered by the Global Environment Facility (GEF).

78. While some funding has been made available for capacity-building by GEF resources, most adaptation measures being undertaken in small island developing States have been financed by internal sources. Finding sufficient financing is still the greatest challenge for many island States in their pursuit of adaptation measures and resilience-building.

VIII. Regional and international cooperation

79. Significant emphasis is being given to strengthening regional institutional infrastructure to help small island developing States achieve sustainable development. To maximize economies of scale, share human resource capacity and promote more efficient use of donor support for regional initiatives, regional intergovernmental and technical organizations have increasingly undertaken many activities, including coordination of regional and subregional projects, organizing workshops and supporting Governments in the preparation of national plans. Examples of important initiatives are given below.

80. The Pacific Islands Forum recently published a resource book to assist policy and decision makers with information to ensure effective implementation of appropriate resilience-building measures. This is but one result of the Pacific-Japan cooperation project, which has developed a portfolio of project-based responses for the Pacific island States.

81. The Caribbean Renewable Energy Development Project was established to foster greater use of renewable energy in the Caribbean, with a view to transforming the environment for research and investment in renewable energy technologies. The project reduces risks for investors in renewable energy projects, ranging from wind and biomass cogeneration to photovoltaics and hydropower. Regional programmes designed to remove barriers to renewable energy use have also been initiated in small island developing States, some with the support of GEF resources.

82. Support for small island developing States by the agencies of the United Nations system is ongoing. Relative initiatives were identified in a draft programme to operationalize the Mauritius Strategy (A/60/401). Measures for energy efficiency and the development of renewable energy are among the key interventions by United Nations agencies working in small island developing States.

83. Small island developing States may have access to resources from the GEF trust fund for activities associated with their reporting obligations under the United Nations Framework Convention on Climate Change. Many have used the resources to establish climate-change committees, develop national climate-change action plans and prepare public awareness campaigns on climate change and adaptation measures. Island States have been active in regional cooperation activities designed to help build capacity for conducting vulnerability and adaptation assessments and to mainstream the issue of climate change into development planning. A project on mainstreaming adaptation to climate change, which focuses on the design and implementation of adaptation strategies in the Caribbean, is an example of such regional cooperation.

84. The United Nations Conference on Trade and Development (UNCTAD) offers assistance to small island developing States towards implementing appropriate trade adjustment strategies and enhancing their competitiveness in international markets.

Assistance includes support for product diversification and the development of niche markets. Capacity-building to strengthen their participation in trade negotiations at the regional and international levels is also an important area of UNCTAD support.

85. Other innovative funding mechanisms exist and can be emulated. The Global Sustainable Energy Islands Initiative, a consortium of international non-governmental organizations and multilateral institutions, is an example of support for the Alliance of Small Island States by bringing renewable energy and energy efficiency projects, models and concepts together in sustainable energy plans. The Initiative seeks to showcase national efforts to significantly reduce greenhouse gasses and to accelerate the transition of small island developing States towards cleaner, more sustainable energy use. Inaugurated at Johannesburg, South Africa, in 2002, the first five-year plan was initiated with the development of national sustainable energy plans and projects in Saint Lucia, Grenada and Dominica. The Initiative, which is committed to raising US$ 100 million during the first period for energy investment, is a model partnership with the wider international community that would be of significant value for long-term sustainable energy development in small island developing States. There has also been bilateral support from the donor community for island States.

IX. Continuing challenges

86. **Small island developing States will continue to tackle the fundamental challenge of managing competing priorities for development with limited resources at the disposal of Government and local decision makers. The pursuit of innovative financing and new partnerships to meet this challenge will therefore remain a priority.**

87. **With deep political commitment, small island developing States have expressed the need to strengthen integrated decision-making and implementation to ensure a well-coordinated, multisectoral approach to resilience-building through enhanced energy efficiency, alternative energy and management of pollution, promotion of industrial development and climate-change adaptation. The development and implementation of national sustainable development strategies in small island developing States is an important step in that regard.**

88. **There is much scope for the development of renewable energy sources. In the Caribbean, for example, renewable energy accounts for less than 2 per cent of the region's commercial electricity. Low levels of renewable energy are mainly due to a lack of awareness and understanding of those energy sources and to the limited access to technologies required to tap them. The development of renewable energy technologies and the promotion of their use, including through public education, therefore remains a priority for many small island developing States, particularly through public education and awareness.**

89. **Small island developing States continue to focus attention on the strengthening of institutional and human capacities to facilitate vulnerability assessment, energy management, disaster preparedness and mitigation at the national level, supported by action at the regional level. Long-term attention will have to be paid to the development of specialized skill sets in relevant**

fields, such as climate modelling for small island developing States, disaster management and scientific and technological research for the development of renewable energy sources. The strengthening of institutions for data collection and analysis is also critical for effective monitoring and assessment. In the interim, small island developing States have expressed their interest in a facility for the deployment of short-term experts to bridge skills gaps.

90. **The expansion of trade will continue to be the main source of income for small island developing States. Support will be required for diversification strategies, the development of niche markets and the exploration of innovations in industry, such as the transformation of sugar cane plantations to support an ethanol production industry.**

Notes

[1] *Official Records of the Economic and Social Council, 2005, Supplement No. 9* (E/2005/29), chap. I, sect. C, resolution 13/1, para. 7.

[2] See www.unep.org/GEO/pdfs/Caribbean_EO.pdf.

[3] See ECLAC *Renewable Energy Sources in Latin America and the Caribbean: Situation and Policy Proposals* (2004).

[4] See *World Bank Economic Report* (2000).

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Outcome of the International Symposium on Integrated Implementation of Sustainable Development Goals

Note by the Secretariat

The Secretariat has the honour to transmit to the Commission on Sustainable Development at its fourteenth session the outcome of the International Symposium on Integrated Implementation of Sustainable Development Goals (see annex).

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Annex

Outcome of the International Symposium on Integrated Implementation of Sustainable Development Goals

Nanchang, China, 10-12 May 2005

I. Introduction

1. The International Symposium on Integrated Implementation of Sustainable Development Goals was held in Nanchang, China, from 10 to 12 May 2005. It was organized by the Department of Economic and Social Affairs of the United Nations Secretariat and was hosted by the provincial government of Jiangxi province, China. Some 150 participants from government agencies, international organizations, the scientific community and research institutions, the business sector and civil society groups from both developed and developing countries attended the Symposium.

2. The meeting was organized in 12 thematic sessions featuring over 30 speakers. Discussions were based on case studies and addressed the social, economic and environmental dimensions of sustainable development.

3. The commitment of the people and the government of Jiangxi province to the goals of sustainable development was recognized by all participants.

II. Thematic discussions

A. National sustainable development strategies

4. National sustainable development strategies are an important tool for integrated sustainable development. Such strategies have proven successful when they integrate economic development, environmental protection and social equity and take into account international agreements and the potential for international cooperation. They can integrate policies and programmes of various ministries and efforts at the national, provincial and local levels and involve the private sector, academia, the scientific and technological communities, community organizations and non-governmental organizations. The Internet can be a valuable tool for involving a large number of people and different organizations and for exchanging information.

5. National sustainable development strategies should be based on sound science and should have clear targets and indicators, with provisions for monitoring progress towards the targets, such as through annual reports on selected indicators. The United Nations has prepared a set of indicators of sustainable development for use by countries in developing national indicators. Governments can also prepare sustainable development plans for their own operations, both to reduce the environmental impacts of their own operations and as an example to others.

B. Contribution of science and technology to sustainable development

6. The transition to sustainable development is a knowledge-intensive learning process. Without access to science and technology and the capacity to use it, the goals and targets of sustainable development cannot be achieved. It is important to employ an interdisciplinary approach to research and development from which social, economic and life sciences can work together in order to ensure a balanced consideration of the social, economic and environmental aspects of sustainable development. Research partnerships should be established that employ the complementary strength of modern science and traditional knowledge and that work across scientific disciplines and cultural boundaries. It is important to establish closer relationships between the world of science and the world of policy, thus enhancing both the production of policy-relevant research results and the credibility of policy decisions that are supported by sound scientific evidence. New methods for long-term analysis that address uncertainties and vulnerabilities and use sound scientific evidence can be a useful tool for more robust policy decision-making.

7. Technological innovations are the key to environmentally sustainable economic growth and improved standards of living. The introduction of new technologies, for example, allowed the Jiangxi Copper Corporation, which is China's biggest copper production base, to make copper products of high quality on its own, reducing reliance on the sale of copper metal. Simultaneously, the Jiangxi Copper Corporation introduced technological innovations developed in-house to advance the reuse of waste water and the use of gas and residues to extract rare and noble metals. The introduction of the new technology resulted in enhanced profitability and productivity.

C. Sustainable land and water development

8. In China, as in many developing countries, high population densities and population growth have led to high and increasing pressure on land, resulting in deforestation, cultivation of fragile lands, overgrazing and soil erosion, which can lead to reduced agricultural yields, increased water runoff and flooding, exacerbated by settlement on lake and river flood plains. Jiangxi province has been addressing these problems through its Mountains, Rivers and Lakes Programme, which involves large-scale reforestation of upland watersheds and resettlement of populations away from flood-prone areas. Waste water treatment facilities have also been introduced to improve water quality in rivers and lakes.

9. Programmes for sustainable agriculture, rural development and poverty reduction in China have included the promotion of biodigesters to generate gas for cooking, lighting and heating from animal manure, while producing high-quality organic fertilizer for crops. This has increased agricultural yields while reducing harmful environmental impacts from the use of agricultural chemicals. The Government has been promoting such ecological agriculture through partial subsidies for the biodigesters and related improvements. Information campaigns for farmers and improved technologies, such as multicropping and intercropping, are also needed to make agriculture more sustainable.

10. Desertification is a major problem in many developing countries, including in north-western China, where, as a result of deforestation and overgrazing, sand and

dust storms are common. Measures to address this problem include bans on logging in sensitive areas and returning unsustainable farmland to grassland and forest, with compensation to farmers. In China and elsewhere, windbreaks and forest belts are being planted to reduce wind erosion and sand and dust storms. Measures are also needed to provide alternative livelihoods to people in poor areas subject to desertification.

D. Sustainable development of forests

11. Forests play a critical role in sustainable development, including economic development, environmental protection, social development and poverty reduction. Environmental damage has been caused by excessive logging, while opposition to such activity has sometimes limited economic development. While the protection of forest cover and forest stock is important, it is also necessary to improve forest productivity, which is lower in China than in developed countries.

12. Forests and forest products can also play an important role in addressing climate change and global warming. Forests are important for carbon storage, and wood products release lower amounts of carbon dioxide than plastics, cement or aluminum, in addition to being renewable. Trading carbon emissions credits and other mechanisms could serve to support sustainable forestry.

E. Energy and sustainable development

13. A major environmental problem in some developing countries, including China, is air pollution and acid rain resulting from the burning of coal. This problem is being addressed through the use of cleaner fuels in cities, but new technologies are also needed, such as coal gasification, together with renewable energies. Since energy efficiency in developing countries is low compared with developed countries, stronger energy conservation measures are needed, together with improved enforcement of existing laws and regulations.

14. Urban air pollution from vehicles is a growing problem in developing countries with rapid economic growth, such as China and other Asian countries. Measures are needed to manage the growth in the number of vehicles in large cities, to reduce emissions and to promote more sustainable modes of transportation, such as railways.

F. Sustainable industrialization

15. Industrialization needs to be brought in line with the principles of sustainable development. Pollution of the air, water and soil resulting from unsustainable manufacturing processes in many countries, including China, is causing immense environmental and human health problems. Production processes that are more efficient in the use of resources, materials and energy are needed. Product development should be guided by a life-cycle approach, with focus on the reuse and recycling of products. In advancing towards sustainable industrialization, access to and use of cleaner production technologies and methods are vital.

16. Government policies can provide incentives, such as subsidies and tax incentives, to encourage companies to make production processes and products more sustainable. Those incentives may be combined with regulatory instruments to guide the process of sustainable industrialization, where necessary. Other measures at the disposal of Governments include requirements for environmental impact assessments, environmental accountability and environmental education to raise awareness of the benefits of sustainable industrialization.

G. Industrial parks

17. Industrial parks provide an institutional context for co-locating related enterprises and improving resource sharing and interaction. Industrial parks can create jobs and speed up the process of industrialization. In addition, they facilitate the monitoring of environmental impacts. Such parks can provide a short-cut for solving environmental problems, safeguarding public health and leveraging benefits for industrial enterprises.

18. Various challenges have to be met relating to industrial parks. First, innovative ways of environmental management should be carried out, so that environmental capacity can be utilized more efficiently. Second, concentrated pollution control should be encouraged to prevent widely scattered emission of pollutants. Third, the paradigm of recycling should be carried out in industrial parks to reorient industrialization. Fourth, environmental indicators need to be established. Finally, regional environmental impact assessments should be conducted for industrial parks.

H. Sustainable urban development

19. The reshaping of urban waterfronts is one example of promoting long-term sustainability in urban areas. Redesigning ports and downtown areas in many harbour cities around the world, together with the introduction of innovative shipping technologies, has provided new opportunities for reallocating waterfront areas for public recreation. This has led, for example, to the complete reshaping of the waterfront in Shanghai.

I. Policy instruments for sustainable development

20. Sustainable development can be achieved most effectively, the costs of environmental protection reduced and public support broadened through the use of a variety of policy instruments, including regulations, economic incentives and flexible mechanisms. Emissions trading, technical assistance and social instruments, such as public information, can all be used towards this end. The most effective mix of policies will depend on the objective — administrative and enforcement requirements and capacities and the political, economic and cultural context. In general, regulations can ensure that basic standards are met by all; flexible mechanisms can reduce the costs of compliance and broaden support; economic incentives can reward those whose performance exceeds the minimum standards; technical assistance can assist those who are willing but not sure how to comply; and public information can support informed consumer choices and public support

for sustainable development policies. In China, licences for the discharge of pollution and the closing down of highly polluting industries using obsolete technologies have been used to reduce industrial pollution.

J. Industrial ecology and sustainable consumption

21. Industrial ecology has emerged as an important approach to improving industrial productivity while reducing environmental impacts. A wide variety of tools and concepts have been developed and applied in both developed and developing countries.

K. General approaches to sustainable development

22. Sustainable development in China will require further infrastructure development, industrial development and restructuring, increased energy and resource efficiency and the development of new and more sustainable technologies. The concept of a recycling economy, including agriculture and industrial production and household consumption, can also help to conserve natural resources and reduce waste and pollution. Since 1993, China has adopted a scientific approach to development by emphasizing greater efficiency through advanced and new technologies and by improving the quality of the work force.

23. International cooperation and the exchange of information are needed to support the efforts of developing countries towards sustainable development. Developed countries and international organizations are prepared to assist those efforts through various forms of financial and technical assistance.

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Letter dated 31 January 2006 from the Permanent Representative of China to the United Nations addressed to the Secretary-General

I have the honour to transmit herewith the text of the Beijing Declaration on Renewable Energy for Sustainable Development, which was adopted at the International Renewable Energy Conference 2005, held in Beijing on 7 and 8 November 2005 (see annex).

I should be grateful if you would have the present letter and its annex issued as a document of the fourteenth session of the Commission on Sustainable Development.

(*Signed*) **Wang** Guangya
Ambassador Extraordinary and Plenipotentiary
Permanent Representative of China to the United Nations

* E/CN.17/2006/1.

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Annex to the letter dated 31 January 2006 from the Permanent Representative of China to the United Nations addressed to the Secretary-General

Beijing Declaration on Renewable Energy for Sustainable Development

1. We, Ministers and Government Representatives from 78 countries, having met at the International Renewable Energy Conference, held in Beijing on 7 and 8 November 2005, reaffirm our commitment to implement the outcomes of the Earth Summit, the World Summit on Sustainable Development, and the 2005 World Summit and to substantially increase, with a sense of urgency, the global share of renewable energy in the total energy supply, as called for in the Johannesburg Plan of Implementation.

2. We welcome the ongoing and future activities and commitments that have arisen from the World Summit on Sustainable Development, the International Conference for Renewable Energies, held in Bonn from 1 to 4 June 2004, the Gleneagles Summit of the Group of Eight and other international and regional initiatives that help promote renewable energy.

3. We emphasize the multiple benefits of increased energy efficiency and the use of renewable sources of energy for improving access to energy services, thereby contributing to the eradication of poverty as called for in the United Nations Millennium Development Goals, increasing job opportunities, improving air quality and public health, reducing greenhouse gas emissions, combating climate change, enhancing energy security and offering a new paradigm for international cooperation.

4. We note with concern that more than 2 billion people in developing countries do not have access to modern energy services and that 2.4 billion people rely on traditional biomass for their basic energy needs. This energy divide entrenches poverty by limiting access to information, education, economic opportunity and healthier livelihoods, particularly for women and children, and erodes environmental sustainability at the local, national and global levels.

5. We also note with concern that recent trends in the world energy market, especially the doubling of oil prices in less than two years, have increased the economic risk of relying primarily on imported energy and a volatile world energy market. By developing local sources of energy such as hydro, wind, solar, geothermal and modern biomass, including liquid biofuels, countries can create diversified energy portfolios that are less vulnerable to wide price fluctuations. There is considerable scope, for example, for deploying biofuels in support of rural development and the transport sector.

6. Despite the growing expansion in the development and use of renewable sources of energy in developed countries, the combined share of renewable sources in the global primary energy supply remains small and limited. Most developing countries have not benefited from such expansion. The international community should strengthen its commitment to the scaling up of renewable energy development and use, especially in developing countries.

7. We agree to take further actions at the national, regional and international levels to accelerate the market uptake of renewable energy technologies and increase investment in research and development, especially by developed countries, in order to enhance efficiency and reduce up-front costs. We also agree on the need for strengthened support for the commercialization and transfer of technologies through North-South and South-South cooperation.

8. We recognize that in significantly increasing the use of renewable energy, we face a number of challenges. Government policies have a significant impact on attracting private sector investment and on the pace of expansion of renewable energy, as demonstrated in several developed and developing countries. Experience has shown that successful actions for scaling up the use of renewable energy include: (a) creating supportive policy, legal and institutional frameworks; (b) securing public sector commitment, including for research and development and procurement policies; (c) leveling the playing field; (d) promoting private sector involvement and a stronger alignment between policy time frames and timelines for investment; (e) supporting the establishment of national renewable energy industries, including small and medium enterprises; and (f) providing access to affordable financing, including micro-financing, and consumer credit mechanisms.

9. We also recognize the need for significant financial resources, both public and private, for investment in renewable energy and energy efficiency, including the use of innovative financing mechanisms, such as loan guarantees and the Clean Development Mechanism, and market-based instruments that can leverage scarce public funds. We are committed to creating a positive investment climate to attract private capital for renewable energy. We emphasize the catalytic role that financial incentives and higher shares of official development assistance can play, and we urge international financial institutions, including the World Bank, the regional development banks and the Global Environment Facility, as well as individual Governments, to significantly expand their investments in renewable energy technologies. We also urge international financial institutions and other actors to design improved instruments and products to ensure the effective blending of public and private financing, which should help in buying down the risks associated with renewable energy technologies.

10. We further emphasize the need for enhanced international cooperation for capacity-building in developing countries for: (a) strengthening national policy frameworks and the integration of renewable energy use into national sustainable development strategies for poverty reduction, health, education, and agriculture; (b) enhancing national capacity for research and development and transfer and diffusion of renewable energy technologies; (c) establishing markets for renewable energy; (d) increasing access to finance; (e) enterprise development for sourcing, installing, operating, and maintaining renewable energy systems; and (f) combining the increased use of renewable energy, energy efficiency and greater application of cleaner fossil fuel technologies.

11. We recognize the need for making technical assistance for renewable energy widely accessible to developing countries, especially the least developed countries. The United Nations system can and should play a key role in this regard. Its capacity and resources should be strengthened, and inter-agency cooperation should be enhanced in order to avoid fragmentation of effort. We also recognize the importance of disseminating information and knowledge, lessons learned and best

practices, and the scaling up of experiences in the development and application of renewable energy and energy efficiency. Connecting multi-stakeholders through networks as well as other international and regional initiatives should facilitate such exchanges and make information more accessible to developing countries.

12. We note with appreciation the major focus on energy in the upcoming 2006/07 cycle of the Commission on Sustainable Development. We also note that the current global situation, including a growing awareness of energy poverty in developing countries, the risk of climate change and the important role that renewable energy should play in sustainable development and energy security, the increasing number of international initiatives and commitments and the volatility of world energy markets, provides an unprecedented opportunity for addressing the strategic challenge of transforming our energy systems and closing the energy divide between poor and rich, and between developing and developed countries. We invite the Commission to consider an effective arrangement to review and assess progress towards substantially increasing the global share of renewable energy as foreseen in paragraph 20 (e) of the Johannesburg Plan of Implementation. This would provide a long-term perspective and encourage prompt action. Such a periodic review could offer opportunities for enhanced national, regional and international cooperation on renewable energy for sustainable development through, for example, the exchange of lessons learned and best practices, and a more favourable environment for technology transfer and the rapid commercialization of innovative renewable energy technologies. The review could also be useful in addressing the linkages between energy and the Commission's biannual thematic cluster and in enhancing voluntary reporting through inputs from relevant international organizations and networks.

13. We welcome the participation and contributions made at the Conference by parliamentarians, local and regional authorities, international institutions, the private sector, international industry associations, non-governmental organizations, civil society, women's groups, youth and academia and emphasize the importance of their continued role in increasing the development and use of renewable energy.

14. We express our deep appreciation and thanks to the people and the Government of the People's Republic of China for successfully organizing the Conference and for their generosity and hospitality. We kindly request the Chinese authorities to consider reporting the outcomes and declaration of the conference to the Commission on Sustainable Development at its fourteenth session.

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Letter dated 31 January 2006 from the Permanent Representative of China to the United Nations addressed to the Secretary-General

I have the honour to transmit herewith the text of the Beijing Declaration on Hydropower and Sustainable Development, which was adopted at the United Nations Symposium on Hydropower and Sustainable Development, held in Beijing from 27 to 29 October 2004 (see annex).

I should be grateful if you would have the present letter and its annex issued as a document of the fourteenth session of the Commission on Sustainable Development.

(*Signed*) **Wang** Guangya
Ambassador Extraordinary and Plenipotentiary
Permanent Representative of China to the United Nations

* E/CN.17/2006/1.

06-23573 (E) 220206

Annex to the letter dated 31 January 2006 from the Permanent Representative of China to the United Nations addressed to the Secretary-General

Beijing Declaration on Hydropower and Sustainable Development

1. We, the representatives of national and local governments, representatives of utilities and the private sector, United Nations agencies, multilateral financial institutions, other international organizations, non-governmental organizations, the scientific community and academia and international industry associations, having met at the United Nations Symposium on Hydropower and Sustainable Development, held in Beijing from 27 to 29 October 2004, reaffirm our shared resolve to achieve the Millennium Development Goals and the sustainable development goals and targets contained in Agenda 21 and the Johannesburg Plan of Implementation.

2. We reiterate that access to energy is essential to achieving sustainable development and is critical for meeting the Millennium Development Goals and the Johannesburg Plan of Implementation targets and commitments.

3. Noting with concern that two billion people do not have access to electricity, we call upon all stakeholders to work in concert to deliver energy services to all in a reliable, affordable and economically viable, socially acceptable and environmentally sound manner.

4. We emphasize that improving access to energy will generate opportunities for economic growth, enhanced education, better health care, more training and employment, as well as higher productivity in business, thereby contributing to sustained poverty reduction.

Strategic importance of hydropower for sustainable development

5. Recalling that the Johannesburg Plan of Implementation calls for a diversification of energy supply and a significant increase in the global share of energy from renewable energy sources, including hydropower, we note that hydropower offers potential for contributing to those goals.

6. We further recall that the Political Declaration adopted at the International Conference for Renewable Energies, held in Bonn from 1 to 4 June 2004, acknowledged that renewable energies, including hydropower, combined with enhanced energy efficiency, can contribute to sustainable development, to providing access to energy, especially for the poor, and to mitigating greenhouse gas emissions.

7. Hydropower represents an important source of energy, accounting for some 20 per cent of world electricity supply. Hydropower has made a contribution to development, as shown in the experience of developed countries where the majority of technically and economically feasible hydropower potential has been exploited, and in some developing countries, where hydropower has contributed to poverty reduction and economic growth through regional development and expansion of industry. In this regard, we note that two thirds of economically viable hydropower potential is yet to be tapped and that 90 per cent of this potential is in developing

countries. In Africa, less than 5 per cent of such potential has been developed. We agree that the large remaining potential in developing countries, as well as in countries with economies in transition, can be harnessed to bring benefits to these countries, bearing in mind that the world's poor use only one twenty-fifth of the energy consumed by the world's rich.

8. While we are convinced of the need to develop sustainable hydropower, along with other options, including the rehabilitation of existing facilities and the addition of hydropower to present and future water management systems, we emphasize that such development should be sustainable from the social, economic and environmental standpoints.

9. We underscore the importance of an integrated approach to dam construction, bearing in mind that aside from generating electricity, dams often perform multiple functions, including supplying water for irrigation, industrial production and residential use, as well as flood prevention and habitat maintenance. We note with concern that demands for water in these areas are already on the rise and that competition for water resources is most likely to intensify in future.

Promoting hydropower development that is environmentally friendly, socially responsible and economically viable

10. Having heard expert presentations on the social and environmental aspects, we acknowledge that progress has been made by Governments, financing agencies and industry in developing policies, frameworks and guidelines that are relevant to individual country contexts for evaluation of environmental and social impacts of hydropower, for mitigation of such impacts and for addressing the concerns of vulnerable communities affected by hydropower development. We also note the many instances of good practice presented and call on Governments and the hydropower industry to disseminate good practice, policies, frameworks and guidelines and to build on them to mainstream hydropower development that is economically, socially and environmentally sustainable.

11. With respect to social aspects, we note that the key ingredients of successful resettlement include minimization of resettlement, commitment to the objectives of the resettlement by the developer, rigorous resettlement planning with the full participation of affected communities, with particular attention to vulnerable communities. We are encouraged by the trend of some Governments to go beyond good practice resettlement by providing benefit-sharing with host communities and call on Governments to consider incorporating such approaches in their legal and regulatory frameworks. We further call upon Governments and regional and local authorities to accord special consideration to culturally sensitive areas.

12. With respect to environmental impacts, we recognize that some hydropower projects have had substantial adverse impacts on the environment. Rigorous environmental impact assessment and mitigation and management plans are an essential part of sustainable hydropower development. We note that norms are now in place for such assessments and planning, but that rigorous application of such norms is not universal. We call on project owners and Governments to strive for good practice in this important area.

13. We call upon Governments to put in place procedures that emphasize the need to plan hydropower developments in a river basin context and in the context of the full range of alternatives for energy production and that planning should give due weight to environmental and social factors, as well as to economic and financial factors.

Hydropower development: investment challenges and opportunities

14. Noting that hydropower projects are highly capital intensive, we call for tangible action to assist developing countries to finance sustainable hydropower. Such assistance should include both conventional multilateral and bilateral loans and guarantees, credits and grants as appropriate to the level of development of the country concerned.

15. Further noting that four fifths of investment in hydropower in developing countries in the 1990s was financed by the public sector, we recognize the World Bank and regional development banks' plans to re-engage in financing sustainable hydropower projects.

16. We urge Governments to create a favourable environment to attract investment for co-financing sustainable hydropower projects. We further urge Governments to establish and strengthen a transparent regulatory framework for private investment, both domestic and international, in hydropower development.

17. Developing country Governments at the meeting call on bilateral agencies to also re-engage in sustainable hydropower development.

Hydropower and sustainable development: the way forward

18. Having considered the social, economic and environmental dimensions of hydropower and its potential contribution to achieving sustainable development goals, we firmly believe that there is a need to develop hydropower that is economically, socially and environmentally sustainable.

19. Having shared perspectives, experiences and best practices from all regions of the world, we invite Governments, United Nations agencies and other international organizations, international industry associations, non-governmental organizations, the private sector and civil society to further address the issue of hydropower and sustainable development in appropriate forums, including through regional meetings, in Africa in particular.

20. We invite Governments, United Nations agencies and other international organizations, non-governmental organizations, the private sector, international industry associations and civil society to report back to the Commission on Sustainable Development in 2006 on their actions in the sustainable development of hydropower.

21. We express our gratitude to the Government of the People's Republic of China for successfully organizing the Symposium and to the Government and people of the People's Republic of China for the hospitality and warm welcome extended to all participants. We pledge to work in determined and concerted action to ensure that

sustainable hydropower is harnessed for poverty reduction and for the achievement of the Millennium Development Goals and Johannesburg Plan of Implementation targets and commitments.

Beijing, 29 October 2004

United Nations E/CN.17/2006/11

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Letter dated 22 February 2006 from the Permanent Representative of Qatar to the United Nations addressed to the Secretary-General

I have the honour to transmit herewith the text of the letter from Abdullah bin Hamad Al-Attiyah, Second Deputy Prime Minister, Minister of Energy and Industry of the State of Qatar, dated 16 February 2006 (see annex), addressed to you, with an enclosure entitled "International Symposium on Natural Gas and Sustainable Development: summary report on conclusions and recommendations".

I should be grateful if you would consider the present letter and its annex as a document of the fourteenth session of the Commission on Sustainable Development for circulation to the members.

(*Signed*) Nassir Abdulaziz **Al-Nasser**
Ambassador
Permanent Representative of Qatar to the United Nations

* E/CN.17/2006/1.

06-25677 (E) 160306

Annex to the letter dated 22 February 2006 from the Permanent Representative of Qatar to the United Nations addressed to the Secretary-General

It is with great pleasure that I express my sincere thanks for the support of the United Nations to the International Symposium on Natural Gas and Sustainable Development, co-organized by the Ministry of Energy and Industry (State of Qatar) and the Division on Sustainable Development (United Nations) in Doha from 6 to 8 February 2006.

This symposium has identified the importance and the strategic dimension of natural gas in achieving the Millennium Development Goals, particularly upgrading the living standards and poverty alleviation in developing countries and in supporting the sustainable development programmes, as outlined in the Johannesburg Plan of Implementation.

The symposium has also adopted the message of Sheik Hamad bin Khalifa Al-Thani, Emir of Qatar, to the world leaders on the inclusion of natural gas and its derivatives as environmental goods. Finally, the symposium has recommended the establishment of a United Nations industrial development regional centre in Doha, aimed at improving energy efficiency and conservation and environmental protection in the region.

We would be grateful if the attached conclusions and recommendations of the symposium (see enclosure) could be considered as a document of the fourteenth session of the Commission on Sustainable Development to be circulated to member States.

(*Signed*) Abdullah bin Hamad **Al-Attiyah**
Second Deputy Premier
Minister of Energy and Industry

Enclosure

International Symposium on Natural Gas and Sustainable Development: summary report on conclusions and recommendations

1. The International Symposium on Natural Gas and Sustainable Development, held in Doha, Qatar, from 6 to 8 February 2006, was co-organized by the Government of the State of Qatar and the United Nations Department of Social and Economic Affairs.

2. The symposium was attended by 150 participants from 37 countries, including senior officials and policymakers of national Governments, representatives of the United Nations and other international organizations, chief executives from the private sector and international industry associations, and representatives of academia and non-governmental organizations.

3. The participants reaffirmed the need to achieve the Millennium Development Goals contained in the Millennium Declaration and to further pursue the goals pertaining to energy for sustainable development contained in the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation) adopted in 2002.

4. Participants noted that 2.4 billion people worldwide still rely on traditional biomass for their basic energy needs and that more than 1.6 billion people in developing countries still have no access to electricity. This energy divide entrenches poverty by limiting access to information, education, economic opportunity and healthier livelihoods, particularly for women and children, and negatively affects the environment at the local, national and global levels. Access to energy is essential to achieving sustainable development goals.

5. Technical issues, including natural gas exploration techniques, extraction methods and cost-effective ways in natural gas processing were discussed at the symposium. Participants were informed of initiatives taken to reduce gas flaring. The symposium addressed issues related to natural gas transport, innovative developments in the liquefied natural gas industry, natural gas storage, distribution and marketing. The symposium also reflected on intermediate and long-term energy development trends, gas market reforms and related policy issues, environmental safeguards, transparency of revenues and revenue sharing and dimensions of social development related to natural gas.

6. The presentations at the symposium emphasized the multiple benefits of increasing the use of natural gas to provide reliable, affordable and environmentally sound forms of energy for sustainable development. More specifically, participants adopted the following summary of conclusions and recommendations.

The role of natural gas in meeting global energy demand

7. Global primary energy demand is widely expected to grow by more than 50 per cent over the next 25 years. Global energy supply will continue to rely by at least 80 per cent on fossil fuels. Natural gas is a major and rapidly growing source of energy in the global energy supply mix. It is available in large quantities, sufficient to meet the expected demand growth. The contribution of natural gas to

the global energy supply is projected to rise from 21 per cent in 2003 to 24 per cent in 2030.

8. Natural gas reserves are mainly located in Western Asia and in Central and Eastern Europe. There are also considerably large on and offshore natural gas reserves in developing countries of Africa, Asia and Latin America that have not yet been fully developed.

9. Participants called for continued and expanded dialogue among the producers and consumers of energy. The participants called for the continued development of the necessary infrastructure to transform the natural gas resources into commodities and to link the supply areas to existing and emerging markets.

Trade in natural gas and energy security

10. Participants expected that the share of the gas supply that is traded between regions would grow from 14 per cent in 2006 to 19 per cent in 2030. Demand for natural gas is expected to continue to increase in many countries of Europe and North America. These regions will increasingly rely on imports from the Middle East and North Africa as their own production of natural gas is expected to level off or decline. Natural gas demand in Asia is also expected to increase continuously, not only in countries such as Japan, the Republic of Korea, China and India, but also in other rapidly industrializing countries in the region.

11. Significantly increased investments will be needed in order to expand the capacities of natural gas pipelines, liquefaction and re-gasification facilities and transport tankers for liquefied natural gas. Participants recommended that global trade in natural gas, its derivatives and trade in the technologies employed in its transformation and utilization should be promoted and should not be subject to trade barriers.

12. Energy security increasingly becomes important, not only among net energy importing countries, but also among energy exporters. Diversification of energy sources and energy suppliers offers options for energy importers to hedge against supply disruptions. Energy exporters may also seek to diversify their markets with a view to hedge against fluctuation in energy export revenues.

Environmental, social and safety dimensions of natural gas

13. The environmental qualities of natural gas are related to its lower greenhouse gas emissions, and its development as a cleaner source of energy is to be encouraged.

14. The development of natural gas is linked to the development of the power sector where high efficiency is obtained in gas-fired combined-cycle technology, offering significant benefits for environmental protection.

15. Participants emphasized the need for continued efforts to reduce flaring and venting of gas associated with the extraction of crude oil. Participants noted that standards are being developed for flaring and venting reduction and encouraged the application of such standards. Participants called on project owners to strive for good practice in this important area and welcomed the contribution of the World Bank's Global Gas Flaring Reduction Partnership.

16. It is also essential to inform the public that natural gas production, transport and use are efficient, economic and safe. The projected growth in trade of liquefied natural gas may be affected by perceptions of safety risks. Public concerns about the safety of liquefied natural gas shipments also require a continued monitoring and improvement of safety procedures to prevent accidents.

17. Natural gas is a strong vehicle for socio-economic development in both producing and in consuming countries.

18. Revenues from natural gas development help to promote sustainable development through benefit-sharing, enhanced social inclusion, poverty eradication and the financing of public expenditure in human and infrastructure development for the future.

19. Adequate public participation in the planning process is essential for the long-term viability of all large-scale natural resource development projects, including natural gas exploration, development and transportation infrastructure planning.

20. Participants also heard the findings of some ongoing political analysis and research on the incidence of conflict over natural resources, including civil wars and secessionist wars, which have negatively affected several poor developing countries rich in natural resources over the past two decades. Adequate precautionary measures and policies are needed.

Technological progress, research and development

21. The Johannesburg Plan of Implementation calls for a greater reliance on advanced energy technologies, including advanced and cleaner fossil fuel technologies and the promotion of cross-border energy trade, including the interconnection of natural gas pipelines. Participants stressed the need for continued research and development in cleaner fossil fuel systems.

22. The development of the gas-to-liquids technology offers options to significantly expand the versatility and use of natural gas. Innovative initiatives are under way in several countries, including, notably, Qatar, to demonstrate the cost-effectiveness of gas-to-liquids technology. The development and application of the technology in Qatar includes efforts of broad-based stakeholder participation, increased emission controls and emission reductions and the effective use of by-products of the gas-to-liquids process. Gas-to-liquids fuel use offers significant benefits for improving environmental conditions, in particular in mega-cities where air quality is under serious strain.

23. With the projected growth in fossil fuel use, anthropogenic emission of carbon dioxide and other greenhouse gases may continue to rise in the future. Technological developments and promotion of carbon sequestration will be crucial to mitigate climate change. Depleted oil and natural gas wells offer suitable sinks for carbon storage. It was observed that carbon dioxide capture and storage options are already technically feasible. Research and development in these technologies should be accelerated.

24. Participants stated that further global cooperation should be encouraged in the development, diffusion and transfer of zero-emissions and advanced low-carbon emitting fossil fuel technologies and the technology to capture and store carbon emissions.

Stability of global gas markets, opportunities for investment and international cooperation

25. Participants at the symposium emphasized the role of natural gas in promoting stabilization of energy markets and pricing so as to minimize the impact of fluctuations in energy markets on vulnerable economies.

26. Participants noted that opportunities for investment in natural gas development are directly linked to the stability of global gas markets. Participants emphasized the need for further international cooperation and policy dialogue on natural gas development, and noted with interest the presentation made by the representative of the Energy Charter secretariat.

27. Natural gas infrastructure projects are highly capital-intensive. Participants called for tangible action to provide financial and technological assistance to developing countries in natural gas development. This should include multilateral and bilateral loans and loan guarantees, credits and grants appropriate to the level of development of the country concerned.

28. The establishment of a regional centre for energy management was recommended. Such a centre may be established in Doha, with a view to fostering international cooperation in the region to promote rational and efficient use of energy.

Making natural gas work for sustainable development

29. Participants emphasized the need to further develop natural gas production and use to contribute to the three dimensions of sustainable development: economic development; social development; and environmental protection.

30. Participants called upon Governments and the natural gas industry to establish policy frameworks conducive to natural gas development and to disseminate good practices and stated that light-handed regulation is essential to encourage necessary investment.

31. Participants encouraged Governments and the private sector to report to the fourteenth session of the Commission on Sustainable Development in May 2006 on their actions in sustainable development of natural gas.

32. Participants recommended that the Government of the State of Qatar consider the submission of this report of the symposium to the fourteenth session of the Commission on Sustainable Development.

33. Participants expressed their gratitude to the Government of the State of Qatar for co-organizing the symposium together with the United Nations Department of Economic and Social Affairs, and to the Government and people of the State of Qatar for the hospitality and warm welcome extended to all participants.